

REMARKS

Examiner James Mitchell is thanked for carefully examining and reviewing the subject patent application. The claims and the specifications have been amended in accordance with the Examiner's kind suggestions, and all claims are now believed to be in condition for allowance.

CLAIM REJECTIONS 35 U.S.C. 112

Reconsideration of the rejection of Claims 34, 35, and 38 under 35 U.S.C. 112, second paragraph, as being indefinite, is requested, based on the following.

In answer to the Examiner's question, "What degree is adhesion improved? ", please apply the following answer:

Referring to the Applicant's Fig .5, adhesion is improved, "by the interlocking grid array, and are over bond pad via contact regions (underneath the bond pads), which is approximately 100 by 100 microns square and the size of the structures are from about 10 to 25 microns in width, approximately 4 microns in height, and from about 4 to 10 in number, per conducting bond pad, thus, increasing surface area for improved adhesion. Conducting lines 51, 52, 53 and 54 are underneath the bond pads and are electrically connected to the

bond pads through the bond pad via contacts, thus the bond pads are "anchored" to conducting lines, as opposed to being "un-anchored or floating". Thus, it is the increased surface area brought about by the interlocking grid array, that is the key to the improved adhesion over conventional structures. This is further explained and proven out in the wire pull testing contained in the Application's specifications. The wire pull testing indicates wire pull test results leaving "nuggets", as opposed to structural failure due to: "peeling, fracture, interface failure". Therefore, to be more precise and clear in the language of Claim 34, an amended Claim 34 is included, substituting the word "added" adhesion for "improved" adhesion.

In addition to amending Claim 34, Claims 35 and 38 have been amended to correct for the lack of antecedent basis for "said conducting bond pads" in Line 2.

CLAIM REJECTIONS 35 U.S.C. 102

Reconsideration of the rejection of Claims 34 and 38 under 35 U.S.C. 102(b), "as being anticipated by Yoshioka", (U.S. 5,357,136) hereafter referred to as Yoshioka, is requested, based on the following.

In reviewing Yoshioka, the Applicant's interlocking grid array, of passivating material and conducting material for the bond pad structures seems not to be disclosed, neither in the Yoshioka's specifications, nor in the claims. The Applicant's invention, in the specifications and in Claims 34 and 37, the invention provides details of the conducting bond pad formed by the interlocking grid array, giving detailed dimensions, e.g., approximately 100 by 100 microns square and the size of the structures are from about 10 to 25 microns in width, approximately 4 microns in height, and from about 4 to 10 in number, per conducting bond pad, thus, increasing surface area for improved, added adhesion.

Please note in Yoshioka's Col.3, lines 60 to 65, "Preferably, a plurality of such openings 7 are provided", which appear to be electrical contact vias, not an interlocking grid array, as claimed by the Applicant. Applicant's structure does contain significant differences from Yoshioka, and furthermore,

the Applicant's Application for Patent is for a structural patent, as opposed to the processing method patent of Yoshioka. The Applicant's Figures 1, 2, 3 and 4 are unique; and are not found in Yoshioka's figures, nor are there similarities.

In reference to the Applicant's Claim 38, "The bond pad structure of Claim 34, wherein said conducting bond pad is formed of aluminum", whereas in Yoshioka's Claims 10 and 14, "said conductive layer comprise materials selected from the group of materials consisting of polysilicon, silicide, refractory metal and polycide." The Applicant's Claim 38 for aluminum is left untouched by Yoshioka's claims, especially since aluminum is clearly not a refractory metal.

CLAIM REJECTIONS 35 U.S.C. 103

Reconsideration of the rejection of Claims 35, under 35 U.S.C. 103(a), as being unpatentable over Yoshioka as applied to Claim 34, is requested, in light of the following.

Yoshioka's method patent does fail to infringe on the Applicant's Claim 35, for conducting bond pads formed of copper. As stated above, referring to Yoshioka's Claims 10 and 14, "said conductive layer comprise materials selected from the group of materials consisting of polysilicon, silicide, refractory metal

and polycide." Many materials are known at the time; but, inferring and given credence to materials that are not written in Yoshioka's specifications and claims, amounts to pure speculation and conjecture; not the "stuff" written patent specifications and claims are made of.

Reconsideration of the rejection of Claims 36, under 35 U.S.C. 103(a), as being unpatentable over Yoshioka, as applied to Claim 34, and further in combination with Camilletti, is requested, in light of the following.

In reviewing Camilletti, there are no comparable bond pad structures disclosed that are similar to that of the Applicant's invention. Some elements of semiconductor technology naturally overlap in invention claims, and are common elements. However, in the Applicant's Claims 34 and 36, the passivating layer is selected from the group consisting of SiO, SiN, and polyimide. Camilletti's disclosure is the use of silicon oxide as a passivating layer, as the Examiner points out. In the Applicant's invention, the key application is forming an interlocking grid array for bond pad formation. In contrast, Camilletti's invention focuses on using hydrogen silsequioxane resins to better connect and anchor conventional bond pads, processing methods rather than a Structure Application.

Furthermore, agree with the Examiner that Yoshioka's invention does not show the passivating layer consisting of silicon oxide. Furthermore, the Applicant's interlocking grid array, of passivating material and conducting material for the bond pad structures seems not to be disclosed, neither in the Yoshioka specifications, nor in the claims. The Applicant's invention is not obvious and has key differences from the cited references.

Reconsideration of the rejection of Claims 37 under 35 U.S.C. 103(a), as being unpatentable over Yoshioka, as applied to Claim 34, is requested, in light of the following.

As stated earlier, in Yoshioka's Col.3, lines 60 to 65, "Preferably, a plurality of such openings 7 are provided", which are electrical contact vias, not an interlocking grid array, as claimed by the Applicant. Applicant's structure does contain significant differences from Yoshioka, and furthermore, the Applicant's Application for Patent is for a Structure Patent, as opposed to the processing method patent of Yoshioka. The Applicant's Figures 1, 2, 3 and 4 are unique; and are not found in Yoshioka's figures, nor are there similarities. Politely disagree with the Examiner statement that, "In any case, it would have been an obvious matter of design choice...", as to the exact

dimensions of the interlocking grid for the bond pad structure, as precisely disclosed by the Applicant, in structure Claim 37.

Also noteworthy, what is not found in the Yoshioka's method claims, the Examiner frequently must rely on Yoshioka's specifications, namely, Col.3, lines 60 to 65, "Preferably, a plurality of such openings 7 are provided" and frequently infer, that some sort of interlocking grid array is formed; but, is not mentioned as such.

Reconsideration of the rejection of Claims 39 under 35 U.S.C. 103(a), as being unpatentable over Yoshioka, as applied to Claim 34, and further in combination with Saran (U.S. 6,232,662) hereafter referred to as Saran, is requested, in light of the following.

In reviewing both Yoshioka and Saran, there are no comparable bond pad structures disclosed that are similar to that of the Applicant's invention. Some elements of semiconductor technology overlap, of course, in invention claims, and are common elements. However, in the Applicant's Claims 39 and 34, the bond pad barrier layer is formed of TaN. Diffusion barrier layers are common practice in the Industry. Furthermore, in the

Applicant's invention, the key application is forming an interlocking grid array for bond pad formation.

Also interesting to note, that what is not found in the Yoshioka's method claims and Saran's structure claims, the Examiner frequently must rely on both Yoshioka's specifications, and Saran's specifications, namely, Saran's Col. 8, lines 4 to 8, that contain a reference to a TaN type barrier formation, and further infer, that some sort of interlocking grid array is formed; but, is not mentioned as such. The Applicant's Structure Application would be remiss for such poorly written "oversights".

In conclusion, for state-of-the-art advanced applications in silicon bonding technology, the applicant's invention is believed to be patentable over Prior Art references, because there seems to be insufficient basis for concluding that the modification of Prior Art disclosures, would have been obvious to one skilled in the art. That is to say, there must be something in the prior art or line of reasoning to suggest that the combination of these various references is desirable. We believe that there is no such basis for the combination

FINAL REMARKS

The Examiner James Mitchell is again thanked for carefully examining and reviewing the subject patent application. The specifications and claims have been reviewed in accordance with all the Examiner's kind suggestions, and after amending the specifications and claims in accordance with the Examiner's helpful suggestions, all claims are now believed to be in condition for allowance.

All rejected claims are now believed to be in allowable condition, and allowance is so requested.

Attached hereto is a marked-up version of the changes made to the specifications and the claims by the current Amendment. The attached page is captioned, "Version With Markings To Show Changes Made."

It is requested that should there be any problems with this Amendment, please call the undersigned Attorney at (914) 452-5863.

Respectfully submitted,



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VERSION WITH MARKINGS TO SHOW CHANGES MADE

PLEASE AMEND CLAIMS 34, 35, and 38 (MARKED VERSION):

34. (AMENDED 2X) A bond pad structure, comprising:
- a semiconductor substrate;
 - a plurality of conductive regions formed over said semiconductor substrate;
 - a passivating layer formed over said conductive regions, having multiple openings to each conductive region;
 - a barrier layer formed over said passivating layer and in said openings;
 - a conducting bond pad formed over each said conductive region and over said barrier layer, whereby an upper surface of said conductive bond pad provides [improved] added adhesion for subsequently formed bonds.

35. (AMENDED 2X) The bond pad structure of Claim 34, wherein said conducting bond pad[s are] is formed of copper.

38. (AMENDED 2X) The bond pad structure of Claim 34, wherein said conducting bond pad[s are] is formed of aluminum.